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EXAMINER

CHANG, AUDREY Y

ART UNIT	PAPER NUMBER
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2872

DATE MAILED: 07/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/700,182

Applicant(s)

FERDINAND ET AL.

Examiner

Audrey Y. Chang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 29 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 13-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on **April 29, 2003** has been entered.

2. This Office Action is in response to applicant's amendment filed on April 29, 2003, which has been entered as paper number 20.

3. By this amendment, the applicant has amended claims 13-27. Claims 13-27 remain pending in this application.

4. The rejections to claims 16-19, 22 and 27 under 35 USC 112, first paragraph, set forth in the previous Office Actions are **withdrawn** in response to applicant's amendment.

5. The rejections to claims under 35 USC 112, second paragraph, set forth in the previous Office Action are **withdrawn** in response to applicant's amendment.

### *Response to Amendment*

6. The amendment filed April 29, 2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: **claim 17** has been amended to include the phrase "said phase plate writing said interference pattern in the substrate". The phase plate simply cannot write interference pattern in the substrate. **Claims 21 and 23** each recites the phrase "positioning a phase plate to create an interference pattern with a relative phase difference of  $\pi$ " is not supported by the specification. Interference pattern will not

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be created by simply positioning a phase plate. Also **claims 19 and 27** recite the phrase “interferometric means coupled to said means for adjusting” that is not supported by the specification.

Applicant is required to cancel the new matter in the reply to this Office Action.

### ***Claim Rejections - 35 USC § 112***

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. **Claims 17-19, 21, 23 and 27 are rejected under 35 U.S.C. 112, first paragraph**, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The reasons for rejection based on the newly added matters are set forth in the paragraph above.

### ***Claim Objections***

9. **Claims 13-27 are objected to** because of the following informalities:

(1) The phrase “a phase plate having an adjustable position and orientation *during* said writing” recited in claim 13 and the phrase “means for adjusting *during* said writing the position of said phase plate” recited in claim 17 are confusing and indefinite. Since it is not clear if “during writing” is at the moment of writing or adjusting the position for each writing. If this means adjusting the position at the moment of writing the grating then error of the adjustment or motion of the phase plate will ruin the recording. The phase plate and therefore the phase shift need to be set at a definite value in order for the grating capable of being recorded.

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(2) The phrase “according to an amplitude separation configuration” recited in claim 18 is confusing and indefinite since it is not clear WHAT is an amplitude separation configuration.

(3) The phrase “according to a wave front separation configuration” recited in claim 19 is confusing and indefinite since it is not clear WHAT is a wave front separation configuration.

(4) Claim 21 is completely confusing and indefinite. The phrase “relative phase difference  $\pi$ ” is confusing and indefinite since it is not clear the relative phase difference is measured between **what**. The phrase “said interference pattern” recited in the claim is confusing and indefinite since it is not clear what is this interference pattern referred to. It is not clear if the interference pattern for the previously written Bragg grating is the same or not as for the newly written Bragg grating. Also if the previous Bragg grating is written with the same phase plate, what is the point of erasing it and write a new one that is the same ?? The claim as it stands now does not give a logical and definite description for defining an workable process.

(5) The phrase “generate a corresponding phase shift in the Bragg grating” is wrong since the phase shift is **recorded** as the Bragg grating.

(6) Claim 23 is completely confusing and indefinite. Claim 23 recites “an interference pattern” and “a new interference pattern” that are not sure if they are related or how are they related to each other. The phrase “said interference pattern” is indefinite since it is not clear which interference pattern is referred to. Also it is not clear what is considered to be a “Faber-Bragg grating”.

Appropriate correction is required.

*Claim Rejections - 35 USC § 103*

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**11. Claims 13-14, 16, 17-18, 20, 21 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al (PN. 4,792,197) in view of the patent issued to Kashyap (PN. 6,307,679).**

Inoue et al teaches a *fabrication apparatus and method for writing a Bragg grating in a substrate* (15, Figure 4) wherein the apparatus comprises a *light source* for generating *two coherent light beams* of same *wavelength*. A *phase plate* (24) having *different phase shift regions* (please see Figure 5), is placed in one of the light beam path to create *sub-beam portions* that have different phase shift. The phase modulated sub-beam portions are interfered with the other light beam at the substrate to create an *interference pattern* that is recorded within the substrate as the *Bragg grating*, (please see columns 3-4). Inoue et al teaches that the phase plate may be placed at *different positions*, (21, 22 or 23), which suggests the plate may be displayed in translational sense. Inoue et al also teaches that the phase plate may be put at different angular positions (Figures 6a and 6b) to create different phase shift effects to the light beam. This suggests that the position and the orientation of the phase plate are adjustable. Although this reference does not teach explicitly about a means for doing such adjustment, such feature is either inherently met or an obvious modification to one skilled in the art for the benefit of actually carrying out the adjustment. Also the position and angular orientation of the phase plate is adjusted as desired for each recording or writing of the Bragg grating as shown in Figures 5 and 6a and 6b, the adjustment therefore is during the writing process.

Inoue et al teaches that the Bragg grating is formed on the substrate based on **photochemical reaction** of the substrate material induced by the interference pattern. It is implicitly true that photochemical process is a chemical reaction within the substrate material induced by the photo energy of

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the incident light of the interference pattern. A commonly known photochemical reaction is photopolymerization which polymerizes the substrate material by the imparting energy. The effect of the photochemical reaction therefore certainly will be within the substrate material. Also, in general, a Bragg grating is by definition a modulation of the refractive index of the substrate material. Inoue et al does not teach such *explicitly*. However, **Kashyap** in the same field of endeavor teaches an apparatus for writing Bragg grating using interferometric arrangement wherein a refractive index grating is formed, (please see Figure 1-2A). It would then have been obvious to one skilled in the art to apply the teachings of Kashyap to modify the grating of Inoue et al, mostly involving the selection of the substrate material, to be a refractive index grating for the benefit of providing an alternative grating material for the grating to be recorded.

With regard to claims 14 and 18, Inoue et al teaches that an *interferometric* arrangement including a beam splitter (12), as the separating plate, for dividing the main beam from the light source into the two coherent beams for creating interference pattern on the substrate and two mirrors (141 and 142) for conducting the coherent light beams to the substrate, (please see Figure 4).

With regard to claim 16, the phase plate (24) has spatially differed phase shift values wherein such phase shift will be imparted on one of the coherent light beam to make it contribute to the light beam in the wave function form as a conjugate variable with respect to the time variable.

With regard to claim 20, Inoue et al teaches that the phase plate introduces a phase shift of  $\lambda/2$ , which corresponds to a  $\pi$  phase difference, (please see column 3, lines 42-45).

With regard to claims 21, Kashyap teaches that a pre-written Bragg grating with no phase shift introduced to the recording beam (3a) may be formed within the optical fiber before recording the Bragg grating with phase shifting arrangement, (please see Figure 5 and columns 5-6). The newly recorded Bragg grating with phase shifting certain will overwrite certain part if not all of the prewritten Bragg grating.

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With regard to claim 25, Inoue et al teaches that the Bragg grating is used in a DFB laser which commonly utilizes an optical fiber grating. Kashyap teaches that the Bragg grating is formed in an optical fiber, (please see Figure 1).

**12. Claims 15 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Inoue et al and Kashyap as applied to claims 13 and 17 above, and further in view of the patent issued to Kashyap et al (PN. 5,377,288).**

The apparatus and method for fabricating a Bragg grating using interferometric arrangement as taught by Inoue et al in combination with the teachings of Kashyap ('679) as described for claims 13 and 17 above have met all the limitations of the claims. Inoue et al teaches the interferometric arrangement is using two mirrors however it does not teach that the interferometric arrangement may also be achieved by using a prism. *Kashyap* et al ('288) in the same field of endeavor teaches a method and apparatus for writing a refractive index grating wherein a **prism** (6, Figures 1, 2, and 5) is used as the interferometric arrangement for providing two coherent beams to interfere with each other on an optical fiber (2) in order to record the refractive index grating in the fiber. It would then have been obvious to one skilled in the art to apply the teachings of Kashyap et al to modify the apparatus of Inoue et al for the benefit of providing an alternative arrangement for creating the Bragg grating. With regard to the feature concerning the adjust means coupled to the interferometric arrangement, it is implicitly true that the adjustment of the phase plate is coupled to the interferometric arrangement in order to properly record the grating.

**13. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Scalora et al (PN. 5,907,427) in view of the patent issued to Inoue et al .**

Scalora et al teaches a *Fabry Perot delay line* that is comprised of two successive fiber gratings (420 and 422, Figure 4A and column 11) interposed at two sides of a cavity. This reference however does



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not teach explicitly that the fiber gratings are formed by using interferometric arrangement with a phase plate. Inoue et al in the same field of endeavor teaches a *fabrication apparatus and method for writing a Bragg grating in a substrate* (15, Figure 4) wherein the apparatus comprises a *light source* for generating *two coherent light beams* of same wavelength. A *phase plate* (24) having *different phase shift regions* (please see Figure 5), is placed in one of the light beam path to create *sub-beam portions* that have different phase shift. The phase modulated sub-beam portions are interfered with the other light beam at the substrate to create an *interference pattern* that is recorded within the substrate as the *Bragg grating*, (please see columns 3-4). Inoue et al teaches that the phase plate may be placed at *different positions*, (21, 22 or 23), which suggests the plate may be displayed in translational sense. Inoue et al also teaches that the phase plate may be put at different angular positions (Figures 6a and 6b) to create different phase shift effects to the light beam. This suggests that the position and orientation of the phase plate are adjustable. It would then have been obvious to one skilled in the art to apply the teachings of Inoue et al to fabricate the fiber gratings of Scalora et al accordingly for the benefit of actually fabricating the fiber gratings with desired phase modulation therefore desired properties for the Fabry Perot delay line.

**14. Claims 23, 24 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Scalora et al in view of the patents issued to Inoue et al and Kashyap ('679).**

Scalora et al teaches a Fabry Perot delay line that is comprised of two successive fiber gratings (420 and 422, Figure 4A and column 11) that are disposed at two sides of a cavity. This reference however does not teach explicitly that the fiber gratings are formed by using interferometric arrangement with a phase plate. Inoue et al in the same field of endeavor teaches a *fabrication apparatus and method for writing a Bragg grating in a substrate* (15, Figure 4) wherein the apparatus comprises a *light source* for generating *two coherent light beams* of same wavelength. A *phase plate* (24) having *different phase shift regions* (please see Figure 5), is placed in one of the light beam path to create *sub-beam portions* that

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have different phase shift. The phase modulated sub-beam portions are interfered with the other light beam at the substrate to create an *interference pattern* that is recorded within the substrate as the *Bragg grating*, (please see columns 3-4). Inoue et al teaches that the phase plate may be placed at *different positions*, (21, 22 or 23), which suggests the plate may be displayed in translational sense. Inoue et al also teaches that the phase plate may be put at different angular positions (Figures 6a and 6b) to create different phase shift effects to the light beam. This suggests that the position and orientation of the phase plate are adjustable. It would then have been obvious to one skilled in the art to apply the teachings of Inoue et al to fabricate the fiber gratings of Scalora et al according for the benefit of actually fabricating the fiber gratings with desired phase modulation and desired properties for the Fabry Perot delay line.

Both Scalora et al and Inoue et al reference do not teach about erasing a previously written Bragg grating. **Kashyap** teaches that a pre-written Bragg grating with no phase shift introduced to the recording beam (3a) may be formed within the optical fiber before recording the Bragg grating with phase shifting arrangement, (please see Figure 5 and columns 5-6). The newly recorded Bragg grating with phase shifting certainly will overwrite certain part if not all of the prewritten Bragg grating. Also the capability of erasing a previously recorded grating is mainly based on the material of the recording medium. It is generally true that the grating recording medium is capable of re-recording the grating by erasing the previous one for the benefit of allowing the medium to be reusable.

With regard to claim 24, Inoue et al does not teach explicitly that the adjustment of the phase plate is by programmable movement. However such modification is considered to be an obvious matter of design choice since to use programmable movement means is quite common in the art and such modification would have been obvious to one skilled in the art for the benefit of providing a better control for the adjustment.

With regard to claim 26, Kashyap teaches that the refractive index grating operated as a Bragg grating is an apodized Bragg grating, (please see the abstract).

15. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Inoue et al and Kashyap as applied to claim 17 above, and further in view of the patent issued to Cook et al (PN. 5,629,998).

The apparatus and method for fabricating a Bragg grating using interferometric arrangement as taught by Inoue et al in combination with the teachings of Kashyap as described for claim 17 above have met all the limitations of the claims. Inoue et al teaches the interferometric arrangement is using two mirrors however it does not teach that the interferometric arrangement may also be achieved by using a Lloyd's mirror. Cook et al in the same field of endeavor teaches a method and apparatus for writing refractive index grating in an optical fiber wherein an interferometric arrangement including the Lloyd's mirror is employed, (please see Figure 1 and columns 1-2). It would then have been obvious to one skilled in the art to apply the teachings of Cook et al to modify the apparatus of Inoue et al for the benefit of providing an alternative interferometric arrangement for recording the refractive index Bragg grating in the substrate.

#### *Response to Arguments*

16. Applicant's arguments filed on April 29, 2003 have been fully considered but they are not persuasive. The newly amended claims have been fully considered and they are rejected for the reasons stated above.

17. In response to applicant's argument, which states that the cited reference Inoue et al reference does not teach that the position and the orientation of the phase plate is adjusted during the writing of the grating, which therefore differs from the instant application, the examiner respectfully disagrees for the reasons stated below. Inoue et al reference teaches that the position and orientation of the phase plate may be altered or adjusted so that gratings of different phase modulation may be recorded. The same

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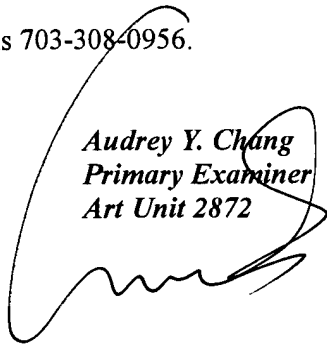
adjustment will have to be also for the instant application since if “during the writing” process, the position of the phase plate is adjusted then no grating will be formed for no identifiable phase modulation will be achieved when the phase plate is moved or adjusted. The cited reference therefore meets the instant application namely the position and orientation of the phase plate is adjusted for each recording.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 703-305-6208. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Drew Dunn can be reached on 703-305-0024. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

*Audrey Y. Chang*  
*Primary Examiner*  
*Art Unit 2872*



A. Chang, Ph.D.  
July 3, 2003